

**Meeting:** 1005, Newark, Delaware, SS 3A, Special Session on Mathematical Methods in Electromagnetic Wave Propagation

1005-78-141            **Darko Volkov\***, 100 Institute Road, Worcester, MA 01609, and **Stephen Shipman**. *Existence of Guided Modes on Periodic Slabs*.

Lossless penetrable periodic slabs are material slabs that are infinitely periodic in two spatial directions and finite in the other. Such a structure can be thought of as an acoustic or photonic crystal slab if it arises from an infinite periodic structure that is truncated to a finite width in one direction.

A bound guided mode is a traveling or standing wave that is supported by the slab in the absence of any source, such as a plane wave incident upon it from the side. The intensity of the field decays exponentially away from the slab and therefore loses no energy through the sides.

We assume that the homogeneous slabs are periodically perturbed by dielectric objects. We first derive lower bounds for the dielectric constants of those objects as a necessary condition for bound guided modes to exist.

Next, we proceed to demonstrate the existence of bound states in particular cases.

The main tool is a volumetric integral equation of Lippmann-Schwinger type that has a self-adjoint kernel.

In addition to the integral equation treatment of the problem, we present a variational approach to finding bound states.

This is a joint work with Stephen Shipman, Louisiana State University. (Received February 06, 2005)